

Specification Volume 1

# Specification of the Bluetooth System

Wireless connections made easy

---

## Core



Version 1.1  
February 22 2001



## Revision History

The Revision History is shown in Appendix I on page 886

## Contributors

The persons who contributed to this specification are listed in Appendix II on page 897.

## Web Site

This specification can also be found on the Bluetooth website:  
<http://www.bluetooth.com>

## Disclaimer and Copyright Notice

The copyright in these specifications is owned by the Promoter Members of Bluetooth SIG, Inc. ("Bluetooth SIG"). Use of these specifications and any related intellectual property (collectively, the "Specification"), is governed by the Promoters Membership Agreement among the Promoter Members and Bluetooth SIG (the "Promoters Agreement"), certain membership agreements between Bluetooth SIG and its Adopter and Associate Members (the "Membership Agreements") and the Bluetooth Specification Early Adopters Agreements ("1.2 Early Adopters Agreements") among Early Adopter members of the unincorporated Bluetooth special interest group and the Promoter Members (the "Early Adopters Agreement"). Certain rights and obligations of the Promoter Members under the Early Adopters Agreements have been assigned to Bluetooth SIG by the Promoter Members.

Use of the Specification by anyone who is not a member of Bluetooth SIG or a party to an Early Adopters Agreement (each such person or party, a "Member"), is prohibited. The legal rights and obligations of each Member are governed by their applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement. No license, express or implied, by estoppel or otherwise, to any intellectual property rights are granted herein.

Any use of the Specification not in compliance with the terms of the applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement is prohibited and any such prohibited use may result in termination of the applicable Membership Agreement or Early Adopters Agreement and other liability permitted by the applicable agreement or by applicable law to Bluetooth SIG or any of its members for patent, copyright and/or trademark infringement.

THE SPECIFICATION IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, SATISFACTORY QUALITY, OR REASONABLE SKILL OR CARE, OR ANY WAR-



RANTY ARISING OUT OF ANY COURSE OF DEALING, USAGE, TRADE PRACTICE, PROPOSAL, SPECIFICATION OR SAMPLE.

Each Member hereby acknowledges that products equipped with the Bluetooth™ technology ("Bluetooth™ Products") may be subject to various regulatory controls under the laws and regulations of various governments worldwide. Such laws and regulatory controls may govern, among other things, the combination, operation, use, implementation and distribution of Bluetooth™ Products. Examples of such laws and regulatory controls include, but are not limited to, airline regulatory controls, telecommunications regulations, technology transfer controls and health and safety regulations. Each Member is solely responsible for the compliance by their Bluetooth™ Products with any such laws and regulations and for obtaining any and all required authorizations, permits, or licenses for their Bluetooth™ Products related to such regulations within the applicable jurisdictions. Each Member acknowledges that nothing in the Specification provides any information or assistance in connection with securing such compliance, authorizations or licenses. NOTHING IN THE SPECIFICATION CREATES ANY WARRANTIES, EITHER EXPRESS OR IMPLIED, REGARDING SUCH LAWS OR REGULATIONS.

ALL LIABILITY, INCLUDING LIABILITY FOR INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OR FOR NONCOMPLIANCE WITH LAWS, RELATING TO USE OF THE SPECIFICATION IS EXPRESSLY DISCLAIMED. BY USE OF THE SPECIFICATION, EACH MEMBER EXPRESSLY WAIVES ANY CLAIM AGAINST BLUETOOTH SIG AND ITS PROMOTER MEMBERS RELATED TO USE OF THE SPECIFICATION.

Bluetooth SIG reserves the right to adopt any changes or alterations to the Specification as it deems necessary or appropriate and to adopt a process for adding new Bluetooth™ profiles after the release of the Specification.

Copyright © 1999, 2000, 2001

3Com Corporation,  
Agere Systems, Inc.,  
Ericsson Technology Licensing, AB,  
IBM Corporation,  
Intel Corporation,  
Microsoft Corporation,  
Motorola, Inc.,  
Nokia Mobile Phones,  
Toshiba Corporation

\*Third-party brands and names are the property of their respective owners.





---

## MASTER TABLE OF CONTENTS

---

For the Bluetooth Profiles, See *Volume 2*.

---

### Part A

---

#### RADIO SPECIFICATION

<b>Contents .....</b>	<b>17</b>
1 Scope .....	19
2 Frequency Bands and Channel Arrangement .....	20
3 Transmitter Characteristics .....	21
4 Receiver Characteristics .....	25
5 Appendix A .....	29
6 Appendix B .....	32

---

### Part B

---

#### BASEBAND SPECIFICATION

<b>Contents .....</b>	<b>35</b>
1 General Description .....	41
2 Physical Channel .....	43
3 Physical Links .....	45
4 Packets .....	47
5 Error Correction .....	66
6 Logical Channels .....	75
7 Data Whitening .....	77
8 Transmit/Receive Routines .....	78
9 Transmit/Receive Timing .....	84
10 Channel Control .....	92
11 Hop Selection .....	126
12 Bluetooth Audio .....	138
13 Bluetooth Addressing .....	142
14 Bluetooth Security .....	148
15 List of Figures .....	178
16 List of Tables .....	181



## Part C

### LINK MANAGER PROTOCOL

<b>Contents .....</b>	<b>185</b>
1 General .....	189
2 Format of LMP .....	191
3 The Procedure Rules and PDUs.....	193
4 Connection Establishment .....	232
5 Summary of PDUs .....	234
6 Test Modes.....	246
7 Error Handling.....	248
8 List of Figures .....	249
9 List of Tables .....	251

## Part D

### LOGICAL LINK CONTROL AND ADAPTATION PROTOCOL SPECIFICATION

<b>Contents .....</b>	<b>255</b>
1 Introduction .....	257
2 General Operation .....	261
3 State Machine .....	266
4 Data Packet Format .....	280
5 Signalling .....	283
6 Configuration Parameter Options.....	297
7 Service Primitives .....	303
8 Summary .....	321
9 References.....	322
10 List of Figures .....	323
11 List of Tables .....	324
Terms and Abbreviations .....	325
Appendix A: Configuration MSCs .....	326
Appendix B: Implementation Guidelines .....	329



---

**Part E**

---

**SERVICE DISCOVERY PROTOCOL (SDP)**

<b>Contents</b>	<b>333</b>
1 Introduction	335
2 Overview	338
3 Data Representation	349
4 Protocol Description	352
5 Service Attribute Definitions	366
Appendix A – Background Information	378
Appendix B – Example SDP Transactions	379

---

**Part F:1**

---

**RFCOMM WITH TS 07.10**

<b>Contents</b>	<b>395</b>
1 Introduction	397
2 RFCOMM Service Overview	399
3 Service Interface Description	403
4 TS 07.10 Subset Supported by RFCOMM	404
5 TS 07.10 Adaptations for RFCOMM	406
6 Flow Control	415
7 Interaction with Other Entities	420
8 References	423
9 Terms and Abbreviations	424

---

**Part F:2**

---

**IrDA INTEROPERABILITY**

<b>Contents</b>	<b>427</b>
1 Introduction	428
2 OBEX Object and Protocol	431
3 OBEX over RFCOMM	435
4 OBEX over TCP/IP	437
5 Bluetooth Application Profiles using OBEX	439



6	References.....	441
7	List of Acronyms and Abbreviations.....	442

---

**Part F:3****TELEPHONY CONTROL PROTOCOL SPECIFICATION**

<b>Contents .....</b>	<b>445</b>
1 General Description .....	449
2 Call Control (CC).....	453
3 Group Management (GM).....	463
4 Connectionless TCS (CL) .....	469
5 Supplementary Services (SS) .....	470
6 Message formats .....	473
7 Message coding.....	485
8 Message Error handling.....	501
9 Protocol Parameters .....	503
10 Bluetooth Standard Character Set.....	504
11 References.....	505
12 List of Figures .....	506
13 List of Tables .....	507
Appendix 1 - TCS Call States .....	508

---

**Part F:4****INTEROPERABILITY REQUIREMENTS FOR BLUETOOTH AS A WAP BEARER**

<b>Contents .....</b>	<b>513</b>
1 Introduction .....	515
2 The Use of WAP In the Bluetooth Environment.....	516
3 WAP Services Overview .....	518
4 WAP in the Bluetooth Piconet.....	522
5 Interoperability Requirements.....	527
6 Service Discovery.....	528
7 Link Manager .....	532
8 Generic Modes .....	533





9	References .....	534
---	------------------	-----

---

**Part H:1****HOST CONTROLLER INTERFACE FUNCTIONAL SPECIFICATION**

<b>Contents .....</b>	<b>537</b>
1 Introduction .....	543
2 Overview of Host Controller Transport Layer .....	547
3 HCI Flow Control .....	548
4 HCI Commands .....	550
5 Events .....	724
6 List of Error Codes .....	766
7 List of Acronyms and Abbreviations .....	777
8 List of Figures .....	778
9 List of Tables .....	779

---

**Part H:2****HCI USB TRANSPORT LAYER**

<b>Contents .....</b>	<b>783</b>
1 Overview .....	785
2 USB Endpoint Expectations .....	787
3 Class Code .....	794
4 Device Firmware Upgrade .....	795
5 Limitations .....	796

---

**Part H:3****HCI RS232 TRANSPORT LAYER**

<b>Contents .....</b>	<b>799</b>
1 General .....	801
2 Overview .....	802
3 Negotiation Protocol .....	803
4 Packet Transfer Protocol .....	807
5 Using delimiters with COBS for synchronization .....	808



6	Using RTS/CTS for Synchronization.....	811
7	References.....	817

#### Part H:4

#### HCI UART TRANSPORT LAYER

<b>Contents</b> .....	<b>821</b>
1 General .....	823
2 Protocol.....	824
3 RS232 Settings.....	825
4 Error Recovery.....	826

#### Part I:1

#### BLUETOOTH TEST MODE

<b>Contents</b> .....	<b>829</b>
1 General Description .....	831
2 Test Scenarios .....	833
3 Outline of Proposed LMP Messages .....	842
4 References.....	845

#### Part I:2

#### BLUETOOTH COMPLIANCE REQUIREMENTS

<b>Contents</b> .....	<b>849</b>
1 Scope.....	851
2 Definitions .....	852
3 Legal Aspects .....	854
4 Introduction to the Bluetooth Qualification Program .....	856

#### Part I:3

#### TEST CONTROL INTERFACE

<b>Contents</b> .....	<b>861</b>
1 Introduction .....	863
2 General Description .....	865



3	Test Configurations .....	870
4	TCI-L2CAP Specification .....	872
5	Abbreviations .....	883

#### Appendix I

REVISION HISTORY .....	886
------------------------	-----

#### Appendix II

CONTRIBUTORS .....	899
--------------------	-----

#### Appendix III

##### ACRONYMS AND ABBREVIATIONS

List of Acronyms and Abbreviations .....	915
Definitions .....	921

#### Appendix IV

##### SAMPLE DATA

Contents .....	925
1 Encryption Sample Data .....	927
2 Frequency Hopping Sample Data—Mandatory Scheme .....	962
3 Access Code Sample Data .....	975
4 HEC and Packet Header Sample Data .....	978
5 CRC Sample Data .....	979
6 Complete Sample Packets .....	980
7 Whitening Sequence Sample Data .....	982
8 FEC Sample Data .....	985
9 Encryption Key Sample Data .....	986

#### Appendix V

##### BLUETOOTH AUDIO

Contents .....	1013
----------------	------



1 General Audio Recommendations .....	1015
---------------------------------------	------

---

**Appendix VI**

---

**BASEBAND TIMERS**

Contents .....	1021
1 Baseband Timers .....	1023

---

**Appendix VII**

---

**OPTIONAL PAGING SCHEMES**

Contents .....	1027
1 General .....	1029
2 Optional Paging Scheme I .....	1030

---

**Appendix VIII**

---

**BLUETOOTH ASSIGNED NUMBERS**

The former appendix Bluetooth Assigned Numbers is now published as a separate document and the latest version is always available at:  
<http://www.bluetooth.org/assigned-numbers.htm>.

---

**Appendix IX**

---

**MESSAGE SEQUENCE CHARTS**

Contents .....	1037
1 Introduction .....	1039
2 Services without connection request .....	1040
3 ACL connection establishment and detachment .....	1044
4 Optional activities after ACL Connection establishment ..	1052
5 SCO Connection establishment and detachment .....	1061
6 Special modes: sniff, hold, park .....	1064
7 Buffer management, flow control .....	1070
8 Loopback Mode .....	1072
9 List of Acronyms and Abbreviations .....	1075
10 List of Figures .....	1076



11 List of Tables .....	1077
12 References .....	1078

---

**Index**

Alphabetical Index .....	1079
--------------------------	------

